Patent claims

1. A device for detecting and evaluating a weight exerted by a person sitting on a vehicle seat, the vehicle seat comprising load carrying parts, the device comprising

   - at least three load cells, said load cells being non-linearly disposed and spaced apart and disposed on said load-carrying parts of the vehicle seat, said load cells each generating a weighing signal corresponding to the weight; and

   - an electronic evaluation circuit, adapted to receive and preprocess the weighing signals of the load cells and generate an output signal based on the weighing signals, the evaluation circuit comprising an evaluation function with which a localization of the center of gravity of the weight acting on the vehicle seat can be carried out from the individual weighing signals of the at least three load cells, and

   - the evaluation circuit comprising a correction function, with which force bypasses can be taken into account in the forming of the output signal,

   - the evaluation circuit comprising a function for automatic zero-drift correction of the weighing signal,

   - and the function for the automatic drift correction comprising a discriminator for differentiating drift in the weighing-signal from low loads of a limited time.

2. The device according to Claim 1, wherein the load cells are disposed such that the force introduction takes place vertically.

3. The device according to Claim 1, wherein the load cells comprise an inductively operating force transducer.

4. The device according to Claim 3, wherein the inductively operating force transducer is a force transducer operating on the eddy current principle.

5. The device according to Claim 4, wherein the force transducer operating on the eddy current principle is operated in such that weighing signals analogous to frequency can be generated.

6. The device according to Claim 1, wherein the device comprises one or more temperature sensors generating measuring signals, the measuring signals being received by the evaluation circuit and used for temperature correction of the weighing signals in the generation of the output signal.

7. The device according to Claim 6, wherein the device comprises a sensor which is to be disposed in a footwell of the vehicle, the sensor generating a force-bypass weighing signal which corresponds to leg placement forces and is received by the evaluation circuit.

8. The device according to Claim 1, wherein the evaluation circuit comprises a function for forming a sliding mean value.

9. The device according to Claim 8, wherein the function of the evaluation circuit for forming a sliding mean value comprises a filter function, said filter function operating to detect values of the weighing signals induced by acceleration, deceleration and/or

vibrations of the vehicle and/or by movements of the person on the vehicle seat, and to discard or use said values of the weighing signals in a way corresponding to predetermined criteria.

10. The device according to Claim 1, wherein the evaluation circuit comprises a functional unit for the calculation of acceleration values of the vehicle, said functional unit exclusively evaluating changes over time of the weighing signals of the load cells.

11. The device according to Claim 1, wherein the evaluation circuit comprises a differentiating function, said differentiating function differentiating on the basis of changes over time of the weighing signals of the load cells between weights which are exerted on the vehicle seat by actual persons and inanimate objects , and supplying a corresponding output signal.

12. The device according to Claim 10, wherein the evaluation circuit has an interface via which vehicle data available in the vehicle can be received.

13. The device according to Claim 1, wherein the evaluation circuit comprises a diagnostic function by means of which the functional capability of the load cells can be checked.

14. The device according to Claim 1, wherein the evaluation circuit comprises a data memory in which at least one of weighing signals, output signals and other measuring signals received by the evaluation circuit can be stored for a predetermined period of time.

15. The device according to Claim 14, wherein the data memory has an associated memory area in which time signals correlating to stored signals can be stored.

16. A method for detecting and preprocessing weights acting on a vehicle seat for determining the mass of an occupant sitting on a sitting area of the vehicle seat, comprising the steps of:

- detecting by means of an electronic evaluation circuit weighing signals of at least three load cells disposed on non-linearly disposed, spaced, load-carrying parts of the vehicle seat;

- forming an absolute overall weighing signal from the weighing signals, the absolute overall weighing signal corresponding to the weight exerted on the seat by the mass of the occupant;

- determining the position of the center of gravity of the weight exerted on the sitting area by the mass of the occupant from the weighing signals;

- correlating the absolute overall weighing signal with the position of the center of gravity, with a correction parameter being determined;

- calling up a mass correction value for the correction of force bypasses in dependence on the correction parameter from a data memory which contains stored mass correction values for absolute overall weighing signals and center-of-gravity positions correlating to them; and

- calculating the mass of the occupant from the absolute overall weighing signal and the mass correction value; and

- correcting the zero point of the weighing signals on the basis of weighing signals of the load cells with the vehicle seat unloaded;

- the zero-point correction being performed by storing for each load cell a last-valid weighing signal W_L with the vehicle seat unloaded and comparing this with the weighing signal W_N of the subsequently valid measurement with the seat unloaded;
  by a difference $D = W_N - W_L$ being formed and it then being checked whether this lies within a predetermined range of zero drift values;
  by this difference being added to a value stored in a difference-value memory in the case in which the difference D lies within the predetermined range;
  and by this difference being discarded and the value stored in the difference-value memory kept constant in the case in which the difference D lies outside the predetermined range.

17. The method according to Claim 16, wherein the method step of correction of the zero point is initiated at predetermined time intervals and/or when predetermined events occur.

18. The method according to Claim 16, wherein the method comprises a diagnozing mode, in which the functional capability of the load cells is checked at predetermined time intervals and/or when predetermined events occur.

19. The method according to Claim 18, wherein, in the diagnosing mode, the occurrence of a difference D is detected in the case of a weighing signal outside the predetermined range and an alarm signal is generated in the case in which this applies only to the weighing signal of one of the load cells.

20. The method according to Claim 19, wherein a signal which identifies the load cell detected as different is generated apart from the alarm signal in the diagnosing mode.

21. The method according to Claim 16, wherein, in a long-term recording mode, the evaluation circuit records for a predetermined sliding time period in an area of the data memory weighing signals, output signals and/or other signals received and/or generated.

22. The method according to Claim 21, wherein the long-term recording mode comprises a statistical function, by means of which the weighing signals of the individual load cells are classified into regular measuring events and irregular measuring events, representing cases of overload, and these are counted, an indicating signal being generated when a predetermined number of overload events is reached.

23. The method according to Claim 22, wherein the weighing signals corresponding to regular measuring events are subdivided into a number of weight classes and wherein for each of the weight classes the measuring events associated with them are counted.

24. The method according to Claim 21, wherein, in the long-term recording mode, in addition to the recording of the respective signals, time signals correlating to the respective signals are recorded in a data memory.

25. The method according to Claim 16, wherein acceleration values of the vehicle are calculated from changes over time of the weighing signals of the load cells.

26. The method according to Claim 16, wherein, taking into account the summated values of the weighing signals, changes over time of the weighing signals of the load cells are used to differentiate whether a weight is exerted on the vehicle seat by a living person or an inanimate object, and wherein an output signal is generated depending upon this differentiation.

27. The method according to Claim 16, wherein vehicle data are received by an interface.

28. The method according to Claim 27, wherein the received vehicle data comprise vehicle speed data and wherein the vehicle speed data are used to determine acceleration values, which are optionally compared with the acceleration values calculated from the changes over time of the weighing signals of the load cells.

29. The method according to Claim 27, wherein the vehicle data contain data which indicate at least one of the unlocking and locking of the vehicle and wherein the reception of the locking and unlocking data starts the process of zero-point correction.

30. The method according to Claim 27, wherein the vehicle data comprise the calendar date, wherein, when carrying out a zero-point correction, the correction performed is stored as an event with an associated calendar date and wherein the currently received calendar date is compared with the calendar date of the last-performed zero-point correction.